

Enhanced Carbon Nanotube Ultracapacitors, Phase I

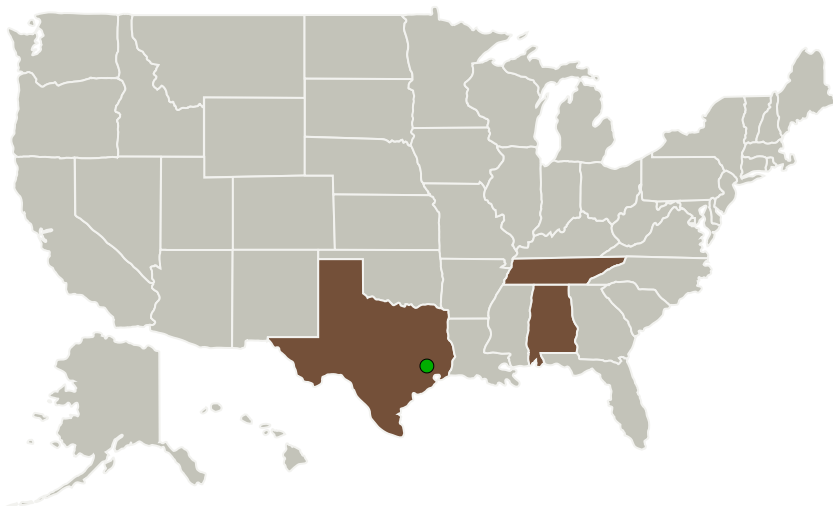
Completed Technology Project (2010 - 2011)



Project Introduction

The proposed innovation utilizes carbon nanotubes (CNTs) coated with pseudo-capacitive MnO₂ material as nano-composite electrode and ionic electrolyte for the construction of ultracapacitors. This novel approach of using nano-structured CNTs architectures provides high surface area of attachment of MnO₂ nano-particles to maximize the charge efficiency and power capacity and to reduce series resistance. Preliminary results at Vanderbilt University using this CNTs/ MnO₂ nano-composite as electrode of an ultracapacitor has demonstrated enhanced capacitor behavior of >400X over pristine CNTs as electrode. During Phase I, we will demonstrate in the laboratory that the proposed novel concept is feasible and measure the power and energy generation capacity, efficiency, and charging/discharging cycle durability. The key factor to successful exploitation of the CNT/ MnO₂ nano-structured composite for ultracapacitor applications is closely related to further understanding and control of the physics, materials, and micro-fabrication technology. The proposed Phase I work provides a systematic, logical, and coherent investigation of the material issue, device fabrication, characterization, simulation, evaluation, and optimization to meet high power requirements.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Scientific, Inc.	Lead Organization	Industry	Huntsville, Alabama
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas
Vanderbilt University	Supporting Organization	Academia	Nashville, Tennessee

Primary U.S. Work Locations	
Alabama	Tennessee
Texas	

Project Transitions

▶ **January 2010:** Project Start

✓ **January 2011:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140655>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Scientific, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

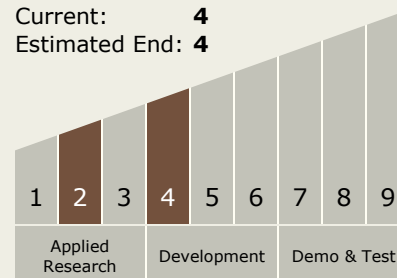
Scott Von Laven

Technology Maturity (TRL)

Start: 2

Current: 4

Estimated End: 4



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.1 Materials
 - └ TX12.1.6 Materials for Electrical Power Generation, Energy Storage, Power Distribution and Electrical Machines

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System